A Review of Kinematics from Physics 11

Remember the equations of motion from grade 11:

$\mathbf{d = v_{av}t}$ $\qquad$ $\mathbf{v = v_o + at}$ $\qquad$ $\mathbf{d = v_o t + at^2}$

$\mathbf{v^2 = v_o^2 + 2ad}$ $\qquad$ $\mathbf{v_{av} = \frac{v + v_o}{2}}$

As before, these formulas can be used to solve a variety of motion problems, particularly where velocity, distance and time are involved. Recall too, that acceleration is a *vector* quantity and direction must be considered when dealing with such problems. For example, if any object is projected into the air, it is under a constant acceleration of **9.8 m/s^2** *downwards*.

When solving such problems, try to organize your thoughts on page. List the quantities you know, then what quantity is needed, and choose an equation to solve your problem. Sketching diagrams may also help, especially when analyzing vectors.

Example 1.
A rocket is projected upwards at an initial velocity of 750 m/s. If there is no air friction,

(a) how long does the rocket take to reach its highest point?
(b) how high does it go?
(c) if it lands at the same level as launch, how long is the rocket in the air?

(see Projectiles Ex 1 for answer)

Example 2.
Using a spring-loaded launcher, a cart is quickly accelerated from rest over a distance of 1.62 m in a time of 0.86 s. It then continues at constant speed along a horizontal table until it reaches a ramp that is sloped at 11.5°. Assuming negligible friction, how far up the ramp does the cart go before stopping? Hint: first find the cart speed after launch; then use components to find the deceleration up the ramp.

(see Projectiles Ex 2 for answer)